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thought by our author to be much below the truth, as there may be perhaps ten and perhaps one hundred, it being impossible to state the number definitely.

Milne concludes, after a lengthy discussion of the facts, that the majority of earthquakes are due to explosive efforts at volcanic foci. "The greater number of these explosions take place beneath the sea, and are probably due to the admission of water through fissures to the heated rocks beneath. A small number of earthquakes originate at actual volcanoes. Some earthquakes are produced by the sudden fracture of rocky strata or the production of faults. This may be attributable to stresses brought about by elevatory pressure. Lastly we have earthquakes due to the collapse of underground excavations."

The work concludes with brief chapters on earth tremors, earth pulsations and earth oscillations.

WHEELER'S REPORT UPON THE THIRD INTERNATIONAL GEOGRAPHICAL CONGRESS.—"Better late than never" is the adage which enters the mind upon reading that the congress, the proceedings of which are here reported, was held at Venice, Italy, during the last half of the calendar year 1881. As these geographical congresses are held every five years, this volume just escapes being mistaken for a forecast of the fourth congress. Representatives from twenty-nine nationalities, embracing three-fourths of the earth's inhabitants, were present. The question of a common initial meridian and uniform standard time seems to have been the most prominent matter brought before the attention of the assembled geographers and explorers, but votes were taken upon forty-seven questions. Among these were the exact trigonometrical determination of the position of light-houses, the establishment of subordinate meteorological stations to connect polar stations with those in middle latitudes; the desirability of registering the superficial temperature of the soil; the compilation of a universal phonetic alphabet; the representation of mountains (in elementary atlases) by level curves; the fixation of a universal scheme of coloration for different heights, depths, and kinds of soil, and the preparation of lists of the explorers of each country. The Exhibition was held in seventy-four rooms in the royal palace, and was attended by about 150,000 visitors.

The principal part of the volume is occupied with an account of the Government Land and Marine Surveys of the World, commencing with a summary of the origin, organization, administration, functions, history, and progress of these surveys, with lists of the general and special topographic maps published, etc. Capt. Wheeler states that in all the older civilized countries the topographic survey is the principal one, and that in all large and well organized Governments it has been continuously maintained under military administration. No such survey now exists in the United

States. The topographic and geological surveys of the various countries are next taken up separately, commencing with Great Britain and its colonies. In Asia only one independent country, Japan, seems to have topographic and geologic surveys. Those which were inaugurated by Brazil, the United States of Colombia, Ecuador, Peru, Costa Rica, San Salvador, Guatemala, and Mexico were all stopped at the date of the writing of the report. The maps include one of the world, showing the areas which have been trigonometrically surveyed, a more detailed map of the European surveys, and another of the United States, and several sections from the topographic maps of various European countries. The advantages of the various methods of representing relief can be studied by comparing the hachures illuminated by oblique light of the Swiss atlas with those illuminated by vertical light of that of Russia, and both with the system of curves adopted in the Spanish survey. The section from Siegfried's atlas of Switzerland gives the slighter elevations in curves, the higher in hachures, and fulfills its purpose admirably. In the maps of Saxony curves and crayon shading are used, while in that of France five colors are used in combination with contour lines. There is unfortunately a lack of references to enable one unversed in all the varieties of topographic representation to understand them. The necessity of a consensus on the subject is evident.

THE MORPHOGENY OF THE VERTEBRAL COLUMN IN THE AMNIOTA.<sup>1</sup>—In this brochure of thirty pages Dr. Baur gives a historical review of the opinions of anatomists as to the homologies of the vertebral segments, which are most easily distinguished among the Rhachitomous Batrachia. There have been three different views on this subject, those of von Meyer, Cope and Gaudry. The opinion of Gaudry has been supported by Fritsch and Lydekker. Von Meyer regarded the intercentrum in Archegosaurus as an inferior vertebral arch, corresponding below, to the neural arch above. Cope believed it to be a distinct body, intercalated between the true centra, which he regarded as represented by the two pleurocentra. Gaudry thought that the pleurocentra and intercentrum together form a centrum, and he therefore names Cope's intercentrum "hypocentrum." Dr. Baur shows Cope's view to be the correct one on various grounds. Among these is the double bilateral origin of the true centrum in Vertebra, as shown by Müller, Roseberg, Albrecht and Froriep.

DIE CLASSEN U. ORDNUNGEN DES THIERREICHS IN WORT U. BILD; von J. G. Bronn; Reptilien, fortgesetzt von Dr. C. K. Hoffman.—This important publication is progressing in its various departments, and bids fair to reach an early completion. Many of its departments are contributed by able naturalists. The de-

<sup>1</sup>*Ueber die Morphogenie der Wirbelsäule der Amnioten.* Von Dr. BAUR. Biologisches Centralblatt, August, 1885.